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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/684,148	10/10/2003	Andrew J. Cobley	50799-2 DIV	2314
21874	7590	08/30/2006	EXAMINER	
EDWARDS & ANGELL, LLP			WILKINS III, HARRY D	
P.O. BOX 55874			ART UNIT	
BOSTON, MA 02205			PAPER NUMBER	

1742

DATE MAILED: 08/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

#11

<b>Office Action Summary</b>	<b>Application No.</b> 10/684,148	<b>Applicant(s)</b> COBLEY ET AL.	
	<b>Examiner</b> Harry D. Wilkins, III	<b>Art Unit</b> 1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 May & 10 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 49-61 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 49-61 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Status*

1. The rejection of claim 57 under 35 USC 112, 2<sup>nd</sup> paragraph has been withdrawn in view of Applicant's amendment.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claim 61 is rejected under 35 U.S.C. 103(a) as being unpatentable over Eckles (US 4,384,930) as evidenced by Fletcher et al (US 4,168,214) and Chan (US 3,758,386) in view of Watson (US 4,376,685).

Eckles teaches (see abstract, col. 1, lines 8-20, col. 5, lines 7-63 and col. 13, line 46 to col. 14, line 17) an apparatus, a Hull cell, for electroplating wherein the cell is filled with a metal plating bath including a copper salt and an aldehyde, such as benzaldehyde. The electroplating bath of Eckles included a brightener compound, but does not expressly recite a brightener of the claimed composition.

Eckles fail to expressly teach that the Hull cell included an insoluble anode and a cathode. Fletcher et al further describe the structure of a Hull cell (see col. 8, lines 50-55) included a cathode substrate to be coated and an insoluble anode. Thus, the Hull cell of Eckles would have been considered to include an insoluble anode and a cathodic

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substrate to be electroplated. In order for the electric circuit to be completed, both the anode and cathode would have been in contact with the electrolyte.

Regarding the fact that benzaldehyde has been deleted from Applicant's laundry list of suitable aldehydes, the hydroxy- derivatives (i.e.-analogs) of benzaldehyde are considered to be to establish a *prima facie* case of obviousness. See MPEP 2144.09. Since Eckles teaches that benzaldehyde and various analogs of it were suitable for use in the copper electroplating baths, one of ordinary skill in the art would have had a reasonable expectation that other analogs of benzaldehyde would have been suitable. Applicant bears the burden of showing that the claimed compounds produce an unexpected improvement over the use of benzaldehyde disclosed by Eckles. Evidence that one of one of ordinary skill in the art would have considered the analogs of benzaldehyde to be equally effective in electroplating solutions can be found in Chan which discloses using benzaldehyde and various hydroxy- or methoxy- derivatives in a zinc electroplating bath.

Thus, the brightener taught by Eckles fails to meet the claimed formula. However, Eckles does teach (see

Watson teaches (see col. 4, lines 30-36 and col. 9, line 63 to col. 10, line 2) that organic sulfosulfonates, and particularly disulfosulfonates, were effective brightening agents in acidic copper electroplating baths. Disulfosulfonates have the general formula:  $(M)SO_3RS-SR SO_3(M)$ , wherein M were metallic cations in solution and each R was a linear  $(CH_2)$  group of 2-6 carbons. While Watson does teach that M were metallic cations, one of ordinary skill in the art would have realized that alkali metal salts of the

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organic sulfonates would have had the same functionality as the unsubstituted organic sulfonates because when the unsubstituted organic sulfonates were added to water, the terminal hydrogen atoms would have dissociated from the molecule. Likewise, the alkali metal cations would become dissociated in solution. Thus, the active material in solution would have been  $(\text{SO}_3^-)\text{--R--S--S--R--}(\text{SO}_3^-)$ .

Therefore, it would have been obvious to one of ordinary skill in the art to have utilized the known organic sulfosulfonates as the brightener for Eckles because Watson teaches that by using the organic sulfosulfonates give bright copper deposits over a wide range of operating parameters and exhibit strong leveling properties.

4. Claims 59 and 49-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eckles (US 4,384,930) as evidenced by Fletcher et al (US 4,168,214) in view of Watson (US 4,376,685).

Eckles teaches (see abstract, col. 1, lines 8-20, col. 5, lines 7-63 and col. 13, line 46 to col. 14, line 17) an apparatus, a Hull cell, for electroplating wherein the cell is filled with a metal plating bath including a copper salt and an aldehyde, such as aliphatic aldehydes. The electroplating bath of Eckles included a brightener compound, but does not expressly recite a brightener of the claimed composition.

Eckles fail to expressly teach that the Hull cell included an insoluble anode and a cathode. Fletcher et al further describe the structure of a Hull cell (see col. 8, lines 50-55) included a cathode substrate to be coated and an insoluble anode. Thus, the Hull cell of Eckles would have been considered to include an insoluble anode and a cathodic

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substrate to be electroplated. In order for the electric circuit to be completed, both the anode and cathode would have been in contact with the electrolyte.

Eckles teaches (see col. 5, lines 18-62) that the electroplating baths contained at least one aldehyde which could have been an aliphatic aldehyde (e.g.-acetaldehyde). Aliphatic aldehydes are aldehydes ( $R^1\text{--CHO}$ ) where the  $R^1$  group was a ( $C_1\text{--}C_{20}$ ) linear alkyl.

Thus, the brightener taught by Eckles fails to meet the claimed formula. However, Eckles does teach (see col. 2, lines 38-51) that known brightening agents in acid copper electroplating baths included organic sulfonates.

Watson teaches (see col. 4, lines 30-36 and col. 9, line 63 to col. 10, line 2) that organic sulfosulfonates, and particularly disulfosulfonates, were effective brightening agents in acidic copper electroplating baths. Disulfosulfonates have the general formula:  $(M)\text{SO}_3\text{RS--SR}\text{SO}_3(M)$ , wherein M were metallic cations in solution and each R was a linear ( $\text{CH}_2$ ) group of 2-6 carbons. While Watson does teach that M were metallic cations, one of ordinary skill in the art would have realized that alkali metal salts of the organic sulfonates would have had the same functionality as the unsubstituted organic sulfonates because when the unsubstituted organic sulfonates were added to water, the terminal hydrogen atoms would have dissociated from the molecule. Likewise, the alkali metal cations would become dissociated in solution. Thus, the active material in solution would have been  $(\text{SO}_3^-)\text{--R--S--S--R--}(\text{SO}_3^-)$ .

Therefore, it would have been obvious to one of ordinary skill in the art to have utilized the known organic sulfosulfonates as the brightener for Eckles because Watson

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teaches that by using the organic sulfosulfonates give bright copper deposits over a wide range of operating parameters and exhibit strong leveling properties.

Regarding claim 49, Eckles teaches (see col. 5, lines 26-29) using 1-25 g/L of aldehyde.

Regarding claim 50, Eckles teaches (see col. 3) that the metal plating bath further included leveling and wetting agents.

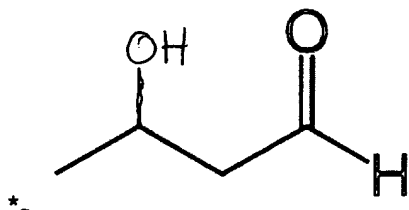
Regarding claim 51, Eckles teaches (see col. 14, acidic pHs ranging from as low as 1.5 to as high as 5.5.

Regarding claim 52, the copper salt used by Eckles was (see Example 15) copper sulfate.

Regarding claim 57, Eckles do not expressly define what substrate is coated by the electroplating process. However, it would have been obvious to one of ordinary skill in the art to have used the copper electroplating bath to coat any conventional substrate to which copper electroplating had been subjected, such as a wiring board, integrated circuit, silicon wafer, semiconductor, solder bump or decorative articles.

Regarding claim 58, Eckles teaches (see col. 13, using a current density of 0.2-20 A/dm<sup>2</sup> (1.858-185.8 A/ft<sup>2</sup>).

Regarding claim 60, Eckles suggest using 3-hydroxy-butanal\*.



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5. Claims 53-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eckles (US 4,384,930) in view of Watson (US 4,376,685) as applied above to claim 59 and further in view of Fletcher et al (US 4,168,214).

The teachings of Eckles are described above.

Eckles fails to teach the composition of the anode used in the Hull cell.

Fletcher et al (see col. 8) teach using platinized tantalum insoluble anodes in an electroplating cell.

Therefore, it would have been obvious to one of ordinary skill in the art to have used the conventional insoluble anodes of Fletcher et al for the electroplating apparatus of Eckles because the insoluble anodes provided high electrocatalytic activity (platinum) while avoiding the problems associated with consumable anodes changing shape.

6. Claims 53-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eckles (US 4,384,930) in view of Watson (US 4,376,685) as applied above to claim 59 and further in view of deWitt (US 3,646,446).

The teachings of Eckles are described above.

Eckles fails to teach the composition of the anode used in the Hull cell.

DeWitt teaches (see abstract, cols. 1 and 2) using a titanium base dimensionally stable anode containing a coating of calcium, strontium or barium combined with ruthenium.

Therefore, it would have been obvious to one of ordinary skill in the art to have used the conventional insoluble anode of deWitt for the electroplating apparatus of



Eckles because the insoluble anode provided high electrocatalytic activity (ruthenium) while avoiding the problems associated with consumable anodes changing shape.

***Response to Arguments***

7. Applicant's arguments with respect to claims 59 and 61 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

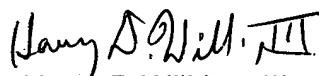
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Harry D Wilkins, III  
Primary Examiner  
Art Unit 1742

hdw